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The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Master of Technology in Industrial Engineering – Level 7
Name of the Examination	:	Final Examination
Course Code and Title	:	**MEX7125 – Energy Management In Industries**
Academic Year	:	2016/17
Date	:	16th November 2017
Time	:	09.30-12.30h
Duration	:	3 hours

General instructions

1. Read the questions carefully before answering.
2. Please note that you should write your registration number and your index number in each pages of your answer book. Do not write your name.
3. In case of doubt, please consult the supervisor or an invigilator conducting the examination.
4. Answer any five (05) questions. Question No. 6 is compulsory.

Q1.

a) Define the term "Preliminary Energy Audit (PEA)"

Briefly explain how you would carry out a PEA in an industrial organisation and the kind of data you would gather during the PEA. **(9 marks)**

b) Describe the expected outcome of a PEA and its usefulness in improving energy efficiency of the organisation. **(9 marks)**

Q2.

Write short notes on four (04) of the following;

1. Energy labelling
2. Dendro Power
3. Global warming
4. Net calorific value
5. Carbon Footprint

(18 marks)

Q3.

a) 'Life Styles' of people have been identified as a major factor influencing energy efficiency.

Discuss this statement with examples (both positive and negative) from real life situations. **(9 marks)**

b) Identify and explain two (02) strategic moves the government may take to influence/encourage people to change towards more energy efficient life styles. **(9 marks)**

Q4.

a) What are the environmental parameters responsible and how they are affecting the thermal comfort level of people in indoor environment?

Explain technological options available to control these parameters. **(9 marks)**

b) Identify three (03) best practices and explain how they can contribute to reduce energy consumption of air conditioning in commercial buildings. **(9 marks)**

Q5.

a) Explain what is 'Demand Side Management'?

Describe how the industrial electricity tariff (given below) has been structured to address DSM in the industrial sector of Sri Lanka. Explain the technological interventions available for industrialists to improve DSM in response to the electricity tariff. **(9 marks)**

b) Explain in detail the benefits accrued to the Electrical Utility (the CEB) and to the industries by implementing DSM initiatives. **(9 marks)**

Electricity tariff applicable to industries

Customer Category I-2

This rate shall apply to supplies at each individual point of supply delivered and metered at 400/230 Volts and where the contract demand exceeds 42 kVA.

Time Interval	Energy Charge (LKR/kWh)	Fixed Charge(LKR/month)	Maximum Demand Charge Per month(LKR/kVA
Peak (18.30 – 22.30)	20.50		
Day (5.30 – 18.30)	11.00		
Off-peak(22.30 – 05.30)	6.85	3,000	1,100

Q6.

a) Describe the different options available for power factor correction in an industrial setting and discussed their advantages and disadvantages. **(10 marks)**

b) During an energy audit carried out in an apparel industry in Sri Lanka, power measurements were taken at the main distribution panel over a period of 24 hours continuously. The measurements revealed among other parameters, the values of following parameters at the peak kVA demand.

Total actual power = 518.2 kW

Maximum demand = 573.8 kVA

It was also noted that load power factor correction has been done using a centralised capacitor bank with provision for future addition of capacitors when required.

Find out the following.

i. Power factor at the peak demand.
ii. Value of reactive power component (kVar) at the peak demand.
iii. kVar value of capacitors required to improve the power factor to 0.99.
iv. Reduction in maximum kVA demand after improving the power factor to 0.99.
v. Using the electricity tariff given under Q.5, calculate the electricity cost savings associated with the power factor improvement 0.99.
vi. If cost of capacitors averages to LKR 1,000/kVar, calculate the cost of capacitors needed for the improvement.

(18 marks)